

**The Spirit of Human Enterprise
A Multivariate Approach to
a Study of Projected Social Organizations**

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Abstract

The goal of the study presented in this paper is based on the idea that James Gibson proposed a radical and productive ecological approach not only to the study of perception but also to conception. The present experiment is an attempt to generalize Gibson's approach to understanding peoples' perception and conception of their social and cultural environment. The experiment has been designed within a multivariate experimental frame and was carried out with 160 lower division university students. The perceptual ability of the experimental subjects were studied with respect to two orthogonally behaving dimensions, one specifying the nature of change, namely development of worth, the other specifying the identity of structure that undergoes change, namely visibility of social structure. Both are highly reliable dimensions ($\alpha_{\max} = .97, .87$). The hypothesis of the existence of a "conceptual cliff" was tested by means of a discriminant analysis. The treatment effect is associated with 77% of the explainable variance, which is an effect very rare in the behavioural sciences.

The contribution to be presented is based on James J. Gibson's idea of an ecological approach to perception. It builds on the hypotheses that (1) the detection of transformational invariants specify the nature of change, while (2) the detection of structural invariants specify the identity of the structure that undergoes change. The hypothesis of the present study was formulated with the goal to transform the Gibsonian approach of perception into the much broader area of real and projected environments. The experiment was set up in such a way that the flow of information and its perceptual differentiation could be studied on the basis of two factorially derived and orthogonally behaving components. It was expected that the manipulation of the component specifying structural information would result in perception of a "shallow", i.e., flat society, while the manipulation of the transformational component was expected to result in perception of "depth", i.e. a society that supports the development of human values.

In order to accomplish this goal it is necessary to establish a correspondence between the physical and social environment in the metaphorical sense. For example, when Gibson (1979, pp. 18-19) refers to the characteristics of the atmosphere as the "environmental medium" that affords a certain behaviour of an organism, this has its metaphorical counterpart in the properties of the social atmosphere. The characteristics of the social medium are that they afford the perception of relational behaviour and the discovery of its meaning. The way in which one individual learns how to discriminate what others perceive and how this "kind of behavioral loop" (Gibson, 1979, p. 42) determines the properties of a social atmosphere involves an analysis of three aspects: (1) the environmental properties, (2) the information specified by these properties and (3) the ability of the perceiver to pick up the specified information from its carriers.

The Observer-Environment Involvement

The structure of the environment defines the conditions which provide positive or negative affordances. Gibson (1979, pp. 127-140) defines an affordance as "an invariant combination of properties at the ecological level. The extraction of these invariants is "what happens both in perceiving and knowing". He further asserts that perceiving and con-

ceiving are "different in degree but not in kind" (Gibson, 1979, p. 258). Moreover, growing experimental evidence from research on impossible figures shows that higher order functions, i.e., invariants, have to be assumed as perceptual basis. Consequently, the goal of the present investigation entails an analysis of not only what is given in the form of present-day civilizations but also an analysis of imagined participation in three constructed alternative future societies, which include new forms of social organization. This necessitates the conception of some kind of utopian vision. For that reason, three picture series were used with the aim to narrate three environments, each based on a particular scientific concept: (1) behaviour modification, (2) cybernetics and (3) evolution.

Behaviour modification. Here, the controlled display of optical texture is a community which attempts to integrate a young man who deviates from the values of the collective. This is attempted by directing him through reinforcement contingencies.

Cybernetics. The society picture is an abstract representation of the implications of limits in interacting systems. The texture surface is laid out as a big city of today. Its functioning is portrayed through a young man, who on his way to the downtown area is confronted with power disconnection, outbreak of fire, bribery, corruption and robbery.

Evolution. The optical texture is laid out as a community which emphasizes evolution both with respect to nature and culture. This is materialized through a young man, who gets to know himself through the act of felling a tree with an axe. Through attention to mental processes, he learns to enjoy physical and mental strain.

The Representational Function of Pictures

The representational function performed by pictures is essential for the projection of the way an individual relates himself to his environment. Conducive to the apprehension of affordances is the concept of intention which determines a cooperation toward common goals. The crucial problem for an information pick-up from optical texture is that one can demonstrate the behavioural significance of the controlled display of optical information as well as its intentional use. The constructed texture surface of a narrative consists of natural units which are nested within larger units. Neither for material nor for optical texture exists any

proper and perfect unit in terms of which texture can be analyzed. According to Gibson (1979, pp. 9, 86), optical texture constitutes the relative fine structure of the ambient optic array providing for a wealth of transitions and overlaps. Therefore, picture perception means perceiving the environment based on ambient optical structure which is not dependent on form but on formless invariants (Gibson, 1979, p. 271). Consequently the study of the mutual Observer-Environment dependencies needs to be based on variables but not necessarily on all attributes possible.

Experiment

Method

The perceiver's pick up of specified information. The perceptual ability of the perceiver will be studied with respect to two orthogonally behaving dimensions, one specifying the nature of change, namely development of worth, the other specifying the identity of the structure that undergoes change, namely visibility of developed worth. Both are highly reliable ($\alpha \text{ max} = .97, .87$) (Bierschenk, 1988). If the component that specifies structural information is the one which is manipulated in the construction of a highly visible society this would mean the perception of "shallowness". On the other hand, if the transformational component specifying the nature of change is manipulated this would result in perception of latent qualities, i.e. "depth".

Subjects. One hundred and sixty lower division university and college students served as voluntary participants. Half of the subjects came from Lund University, the other half from Växjö College, which is situated in another region of Southern Sweden. At the time of the study (April 1988) all students were attending courses in Economics and Business Administration.

Materials. The audio-visual material on "Projections for the future" containing narratives of the three scientific concepts mentioned were transferred onto videotape. The required viewing time for the narratives is for (1) behaviour modification (9 min. 24 sec.), (2) cybernetics (10 min. 18 sec.), and (3) evolution (11 min. 32 sec.).

Design and procedure. To perceive an environment comprises the

coperception of oneself and one's living in the environment specified. For that reason it is necessary to actually live in a certain environment or to anticipate living in that environment be it real or projected. The position taken by a subject within its familiar surrounding (Sweden) form the anchorage of the ratings. Thus, the fact that no optical texture is projected to a point of observation does not mean that it is non-existent (Gibson, 1979, p. 79). Eight doctorate students attending a behavioural science course on data collection and analysis were divided into four groups and assigned the task of finding 40 subjects who were willing to participate. It is reasonable to assume no interaction between the treatment and block dimensions. This procedure calls for an orthogonal 4 x 4 Latin square design (Cox, 1958; Bock, 1975), where the rows represent the groups, while the columns are specified by the order of presentation. Rows and columns are randomized, crossed completely, and each model occurs once in each row and column.

Results

All data collection was assigned as a cooperative task which implies that the final set of data was produced by a combined effort of four groups. Therefore, attention must be given to the possibility of a group effect. But it is equally important to rule out an unexpected order effect, because the same experimental subject was used several times in the ratings. Thus, two types of systematic variation had to be balanced out, one between "Groups" and the other between "Order of presentation". These sources of possible error variance were examined by means of the multivariate analysis strategy reported in Table 1. All results in this and the following table have been calculated with the procedures of SPSS (1986).

The multivariate analysis of variance shown in Table 1 is placed at the top. It displays a very large treatment effect. The larger this effect is, the greater is the degree to which the phenomenon under study is manifested in the population. Thus, the main variation is attributable to an effect very rare in the Behavioural Sciences, which provides for a faithfully high proportion (76%) of explainable variance.

As expected, the order effect is negligible, accounting for only a

very small fraction (2%) of systematic variance. The proportion of variance (8%) associated with the group effect is certainly small, although distressingly common in behavioural science research. Thus, it deserves attention. A follow up by means of a univariate analysis of variance and

Table 1

Multivariate Analysis of Variance for 4x4 Latin Square

Effect	Wilks' Lambda	DF	Error DF	F	Level of Significance
Model	.62	6	1248	212.78	.000
Order	.98	6	1248	2.61	.016
Group	.92	6	1248	9.61	.000

Univariate Analysis of Variance for F1 and F2
F-tests with DF (3, 624)

		Hyp. SS	Error SS	Hyp. MS	Error MS	F	w2	p
Model	F1	352.76	256.74	117.59	.41	285.79	.58	.00
	F2	257.95	359.60	85.98	.58	149.20	.41	.00
Order	F1	2.68	256.74	.89	.41	2.12	.01	.09
	F2	5.22	359.60	1.74	.58	3.02	.01	.03
Group	F1	17.80	256.74	5.94	.41	14.42	.06	.00
	F2	6.60	359.60	2.20	.58	3.82	.01	.01

Univariate Analysis of Variance for Group and F1

Source	DF	SS	MS	w2	p
Hypothesis	3	17.80	5.93	.02	.00
Error	639	621.20	.98		
Total	639	639.00			

Contrast Analysis with Scheffé's Procedure (p = .05)

Mean	Group	4	1	2	3
-.21	4				
-.05	1				
.02	2				
.25	3	*			

After Deletion of Group 3 (= Set of Experimenters)

Source	DF	SS	MS	w2
Between Groups	2	2.05	2.06	.00
Within Groups	477	474.89	1.00	
Total	479	479.00		

Contrasts

Group	4	1	2
Mean	-.12	.02	.10

Table 2

Discriminant Functions and Classification Results

Function Derived	Wilks' Lambda	DF	Chi Square	Level of Significance
0	.23	6	693.25	.000
1	.61	2	231.95	.000

Discriminant Results

		Standardized Discriminant Function Coefficients	
		1	2
Factorpattern	F1	.99	.14
	F2	.24	.98
Eigenvalue		1.64	.63
Relative %		72.26	27.74
Canonical R		.79	.62
Structure Matrix	F1	.97	.24
	F2	-.15	.99
Rotated Matrix	F1	1.00	-.05
	F2	-.05	1.00

Centroids	Coefficients	
	1	2
Behaviour modification	-1.51	.06
Cybernetics	-.92	.74
Evolution	.87	-1.31
Sweden	1.56	.63

Classification Results

Actual	Predicted Membership (%)				
		1	2	3	4
Behaviour modification	1	67	22	7	5
Cybernetics	2	26	5	5	10
Evolution	3	6	4	77	13
Sweden	4	0	3	11	86

Correct Classified 72

contrast analysis reveals a significant deviation produced by the third group of data collectors. After deletion of group 3 any significant deviation between the subsets of data collected disappeared.

Despite an extremely low percentage of non-response (.04%), a screening revealed an unexpected pattern in the missing values. Group 3 contributed not only with the main proportion (.03%) but reported rating

scores that deviated remarkably. The response pattern of ten subjects contained an unproportionally high number of extreme values (1, 10). A comparison with the scores of the remaining subjects within group 3 showed suspiciously many scores near the mean category (4, 6). By discarding the 40 subjects of this group the discriminating power and estimated reliability values in the total set raised.

Perceived environmental change. The central question now is whether and to what extent there are real differences between the projected environments. With the optical texture gradient as point of reference, the affordance of the environments as specified by a transformational as well as structural invariant should be directly perceived. Thus, perceived change is defined over contrasting environments. The results are reported in Table 2. The structure matrix shows a perfect fit between the two established factors and the two discriminant functions. Since both functions behave orthogonally to each other, it can be stated that the discriminant values are uncorrelated. The first function explains 62% of the variance and implies viewing a distinguishable environment in perspective, and this always involves some kind of transformational change. The second function picks up 38% of the variance and is needed to inform the perceiver about the visibility or manifestation of environmental change. The eigenvalue of the functions and associated canonical correlations designate the relative ability of each function to separate the environments. Evidence about the perceiver's ability to pick up significant optical information is reflected in the centroids. The first function serves to distinguish the two projected environments designed on the principle of "formal rationality" from the other two. The second function primarily differentiates the environments with respect to "manifested" worth, i.e. the visibility of progress.

Discussion

The salient characteristic of the simple structure produced is that the correlations between the variables could be explained without employing any control on the initial location of the factors in the configuration of vectors. Exercising control by maximizing the variance through altering

the location of the factors did not add any new information to the psychological interpretation.

The experiment presented has been carried out on the assumption that the perceiver should be able to come in contact with the existence of very different material and immaterial conditions as important aspects of particular environmental structures. The mental operation required for successful perception of oneself acting within the constructed environments implies a "mental moving of one's point of observation", that is, an ego-orientation. This means that the environment can be known despite the fact that descriptive statements have put "optical invariants into words" (Gibson, 1979, p. 262). Because it was possible to formulate statements reflecting structural qualities, it was also possible to formally evaluate the degree of certainty in the perceived environmental properties and to demonstrate common characteristics or affordances basic to all environments.

The localization of the centroids in the two-dimensional space described, shows a clear "conceptual cliff", where the "shallow" side is defined by behaviour modification and cybernetic principles. As demonstrated by the classification results at the bottom of Table 2, formal rationality has its price in the confusion of both principles in that both prescribe the assignment of a "price" or a grade point to every transaction. Thus, they have been successful in encapsulating, i.e., degrading the individual's worth. High visibility without development of worth produce shallowness, while no manifestation of worth, i.e., non-visibility and high emphasis on even more efficient use of human resources generate a pattern of life which is shallow and diffuse.

The "deep" side implies development of worth without visibility of individual progress as emphasized by the society based on the principle of evolution. "Depth" gets its special meaning with the Swedish environment as point of reference. The discriminant scores point toward the desirability of a society which highly supports the development of worth at the same time as it has the capacity to guarantee the visibility of individual progress through high standards of living.

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Author Notes

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